LONDON CENTRE FOR NEGLECTED TROPICAL DISEASE RESEARCH

Mathematical modelling of vector control as a complementary intervention for onchocerciasis elimination

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MRC Centre for Outbreak Analysis and Modelling

NTD MODELLING CONSORTIUM

Imperial College London

wellcome

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"Vector control is a complementary tool to accelerate elimination of Onchocerciasis and can even become a key tool in Onchocerciasis endemic areas where Ivermectin cannot be safely used."

-WHO/APOC (2015)

Report of the consultative meetings on: Strategic Options and Alternative Treatment Strategies for Accelerating Onchocerciasis Elimination in Africa

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Key questions

- How **frequently** should larviciding take place to reduce the biting rate by a specified amount?
- For **how long** should larviciding be applied?
- What is the impact of initial (pre-control) **biting rate**?
- What is the impact of **larvicide efficacy**?

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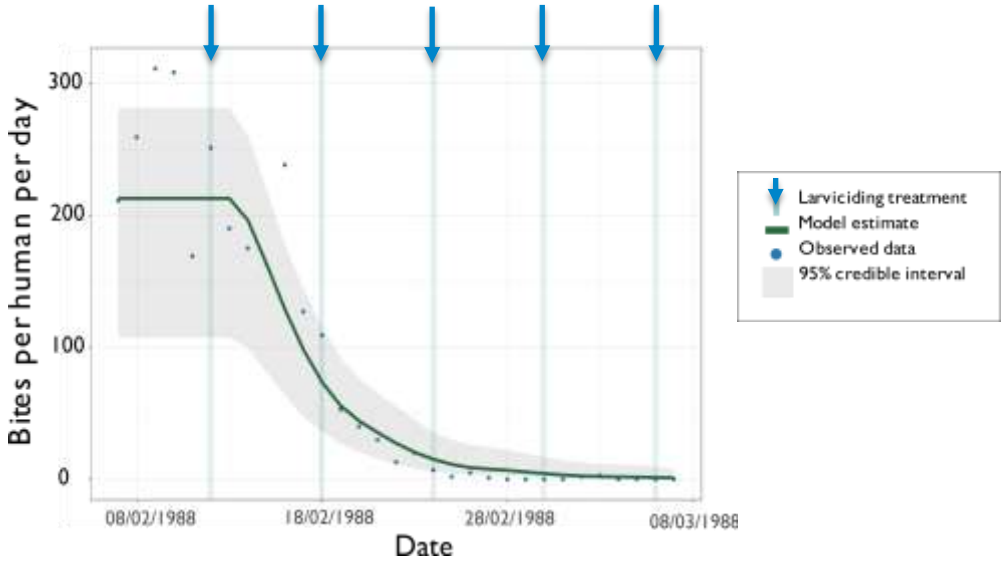
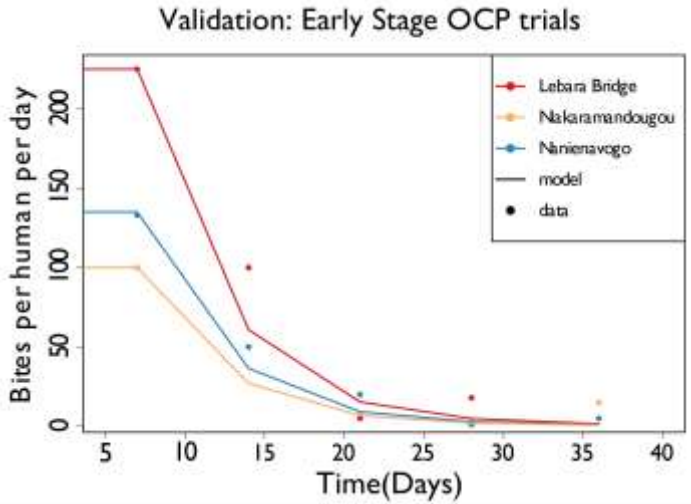
Savannah : *Simulium damnosum* s.l.





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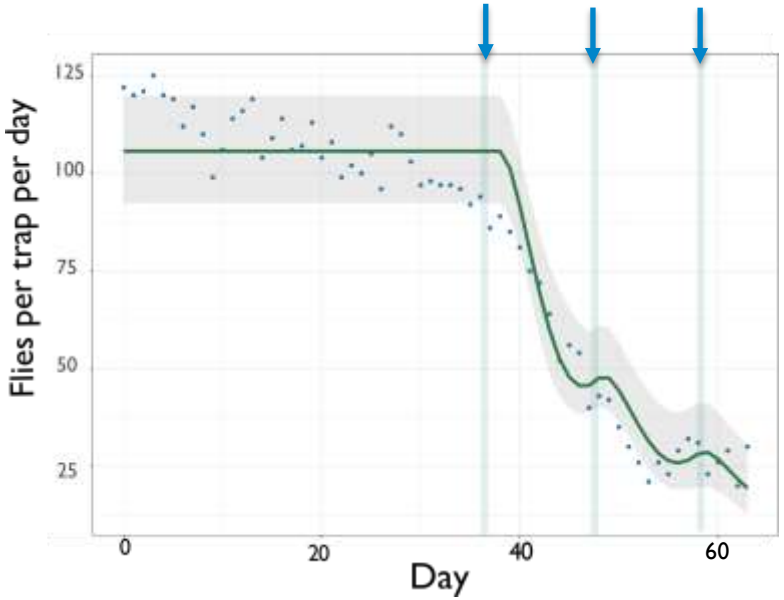
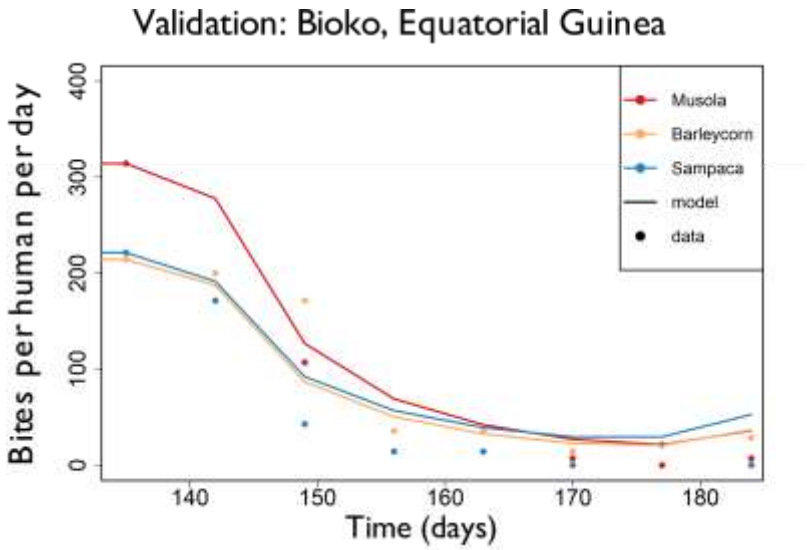
Forest: *Simulium squamosum B*





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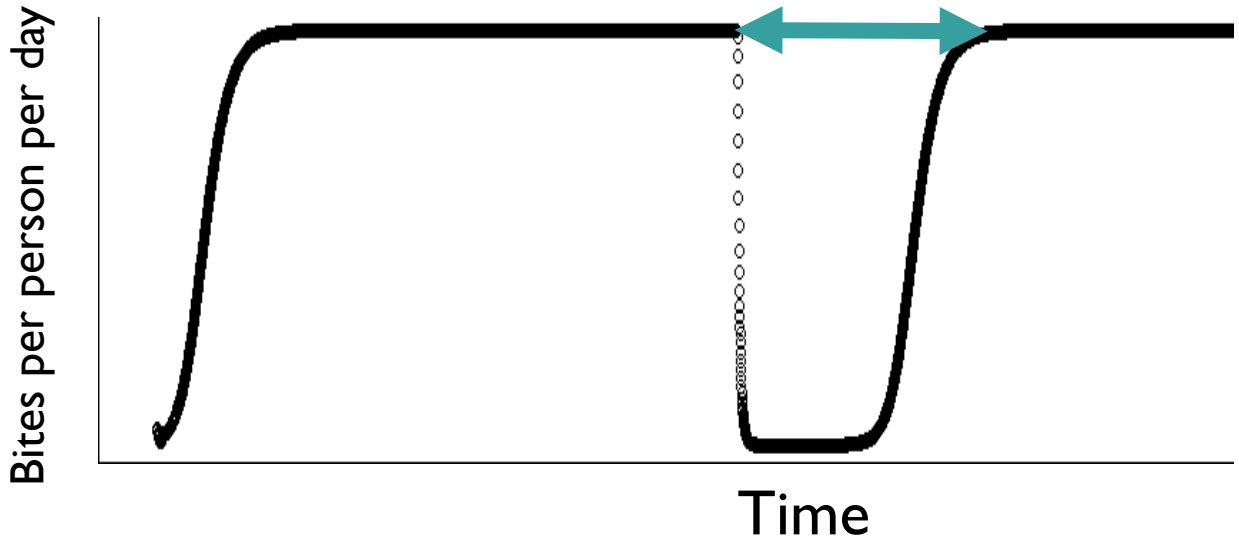
Measures of successful vector control



1) Re-population time

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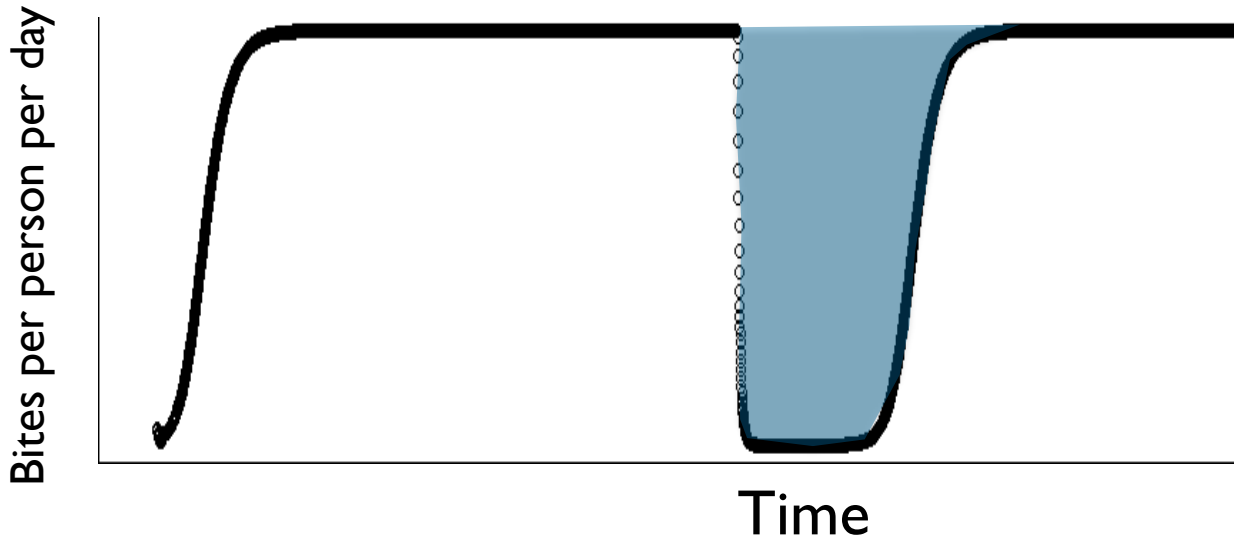
Measures of successful vector control



2) Proportion of bites averted

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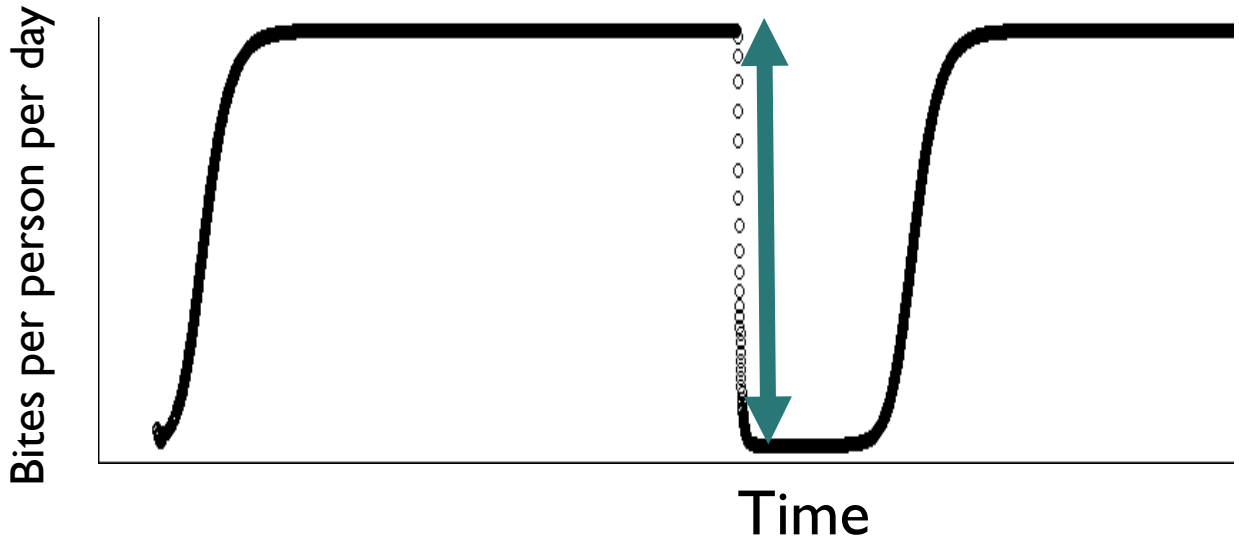
Measures of successful vector control



3) Proportion reduction in DBR

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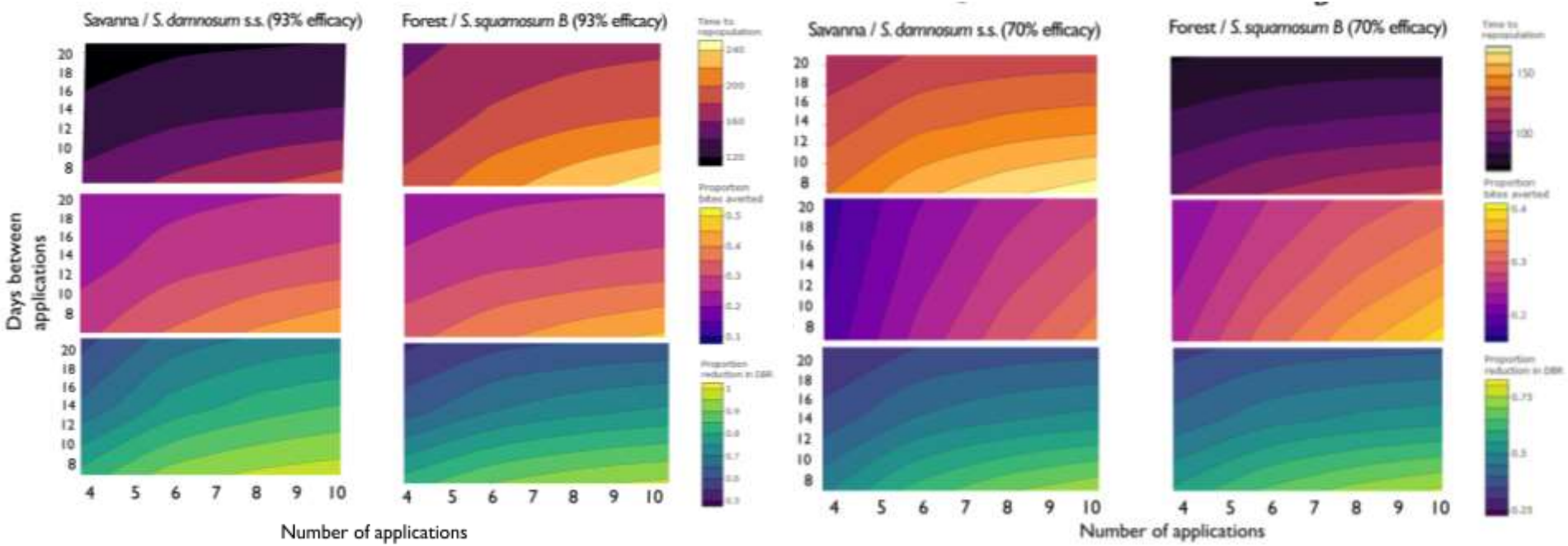

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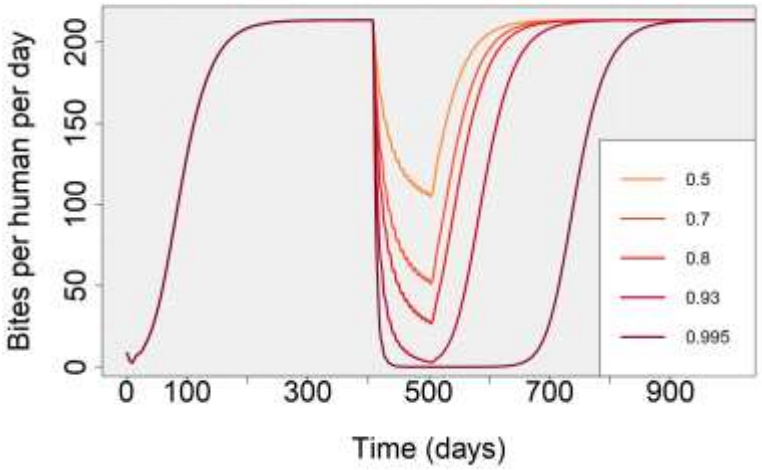
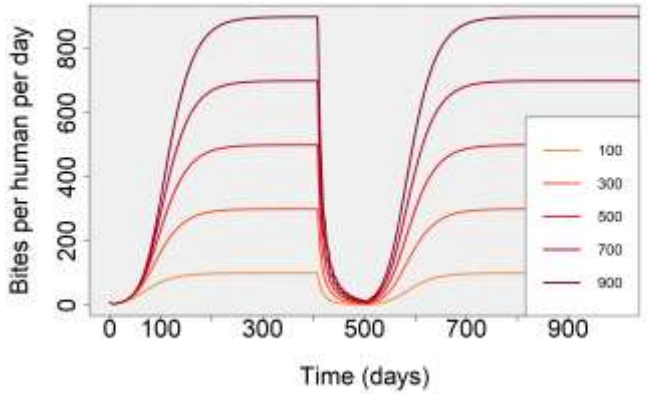
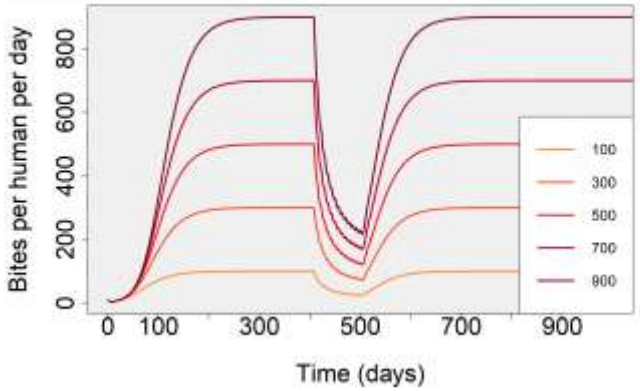
Sensitivity of model output to changes in efficacy



Sensitivity of model output to changes in pre-control DBR



93% efficacy



80% efficacy

In summary

- We developed a model to consider the impact of vector control on blackfly population dynamics and biting rates.
- Larval efficacy strongly affects the reduction in daily biting rate, and measures to improve the efficacy should be prioritised.
- Reducing the interval between larviciding applications is more important in averting bites than carrying out more applications, however the converse is true when aiming to maximise the time to repopulation.
- Contexts with lower temperatures and/or where blackflies have longer gonotrophic cycles are also likely to be more successful candidates.

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